Grade Level: Elementary and Middle School

Subject Correlation: Science, Writing

Objectives: Students will be able to:
1. Observe and describe the cyclic nature of life.
2. Appreciate the importance of a balanced ecosystem.
3. Compare and contrast biodegradable and non-biodegradable resources in nature.

Length: 45-60 minutes for initial compost lesson. Then a few minutes a week or as needed to discuss progress of mini compost piles.

Teacher Preparation: (Numbers will vary depending on whether the teacher prefers students to work individually or in groups.) Each student (or group) will need: a clear plastic 2-liter bottle, scissors, tape, sandwich bag full of kitchen waste, sandwich bag full of garden waste, about two pounds of rich healthy soil, a water bottle, non biodegradable items (like nails, part of an aluminum can, plastic), and several earth worms or red wiggler worms. (Worms are recommended, but optional. Many Web sites sell appropriate worms.)

Outline (with times)
10 minutes
Introduction: Why Compost?
Allow the students to read the attached handout, "*Why Compost*." This will give students a background on what actually happens in a compost pile when it is done correctly, the benefits of composting, and instructions on how to create a compost pile. Consider assigning this handout to students as homework before implementing the lesson.

30 minutes
Create a mini-compost pile
The teacher will break students into groups of three or four. One member of each group must bring:
- A clear and clean two-liter bottle.
- One sandwich bag full of organic food waste like vegetable peels, fruit peels, seeds, coffee grounds and filters, eggshells, nutshells, and other food scraps (Do not use dairy or meat products – they will smell and attract bugs!).

- One sandwich bag full of organic garden waste like grass clippings, sawdust, wood chips, straw, leaves, weeds, paper, and other garden wastes.
- A few small non-biodegradable items like glass, aluminum foil, and Styrofoam.
- Two pounds of rich, dark, healthy soil.

10 minutes

Questions for students to answer after the reading, for homework, or after creating a mini compost pile.

1. What happens to your waste when you throw it in the garbage? Is it reused or recycled?
2. What are some advantages of composting and recycling waste instead of throwing it in the garbage?
3. How do you think the results of this experiment will affect your consumption habits?
4. How do you think the results of this experiment will affect how you dispose of your waste?
5. How does composting affect the size of your Ecological Footprint?

Additional Exercise: Students may want to describe the weekly progress in the mini compost pile in a weekly journal. Be sure the description includes a comparison between the biodegradable and non-biodegradable items. In their first journal entries, students should make predictions about what will and will not decompose and which items will decompose the quickest.

Classroom Composting

earthdaynetwork
www.earthday.net

REDEFINING PROGRESS
www.rprogress.org

Why Compost?

What IS Compost?
Compost forms naturally nearly everywhere! Leaves drop from trees. Grass clippings are left after mowing the lawn. Plants and animals die. Over time, these organic materials break down or decompose. The rich, dark-brown, crumbly, soil-like material that results is called compost.

At home or at your school compost can be made out of leaves, grass clippings, vegetable and fruit scraps, coffee grounds and filters, tea bags, wood chips, straw, and small twigs.

Tiny living things do much of the work of breaking down organic materials to form compost. These tiny workers are called microorganisms and include such things as bacteria and fungi. Animals living in the soil help microorganisms break down organic materials. Worms and pill bugs are examples of organisms that help change organic waste into compost.

As microorganisms and soil critters turn organic materials into compost, they use these materials as food. The organic materials provide many of the nutrients that plants need for growth and activity. Eventually, these nutrients are returned to the soil, to be used again by trees, grass, and other plants. This is nature's way of composting and recycling!

The compost that you make at your home or school can be used as mulch or mixed into the soil. Compost is one of nature's best mulches and soil amendments. By composting and mulching, you can save money by reducing your fertilizer and landscaping bills, lowering your water bill, and spending less on trash pickups or disposal.

Why Compost?
With the composting methods described here, you can help the composting cycle work even better than it does in nature. The organic waste you put back into the environment can be used by other living things. This way, instead of going to a landfill or garbage-burning plant, your waste becomes a valuable resource.

Yard waste and food scraps make up 20% to 30% of garbage! Many landfills are filling up and closing. Finding places to put garbage is a big problem. By composting yard and kitchen waste, you send less garbage to landfills.

Gardeners use compost. Compost allows the soil to hold more water and adds nutrients to the soil. Flowers, vegetables, trees, shrubs, houseplants, lawns, and container gardens grow better in soil mixed with compost.

How Does Composting Work?
Composting will take place through either organic decomposing or with the use of worms. Worms will speed up the process by digesting components of the compost pile. However, you will need to care for the worms if you add them to the compost mixture. Normally, worms live in the soil and eat the small tidbits of organic matter such as leaves and twigs that nature provides. Worms like to have more to eat. A lot of the things you call waste – for example, banana peels, rotten apples, brown wilted lettuce, fallen leaves and weeds from your garden – are food for worms.

Be sure to include a mixture of wastes high in nitrogen and carbon to your compost pile. A proper compost pile requires both carbon and nitrogen, especially if you add worms to the pile. Worms need a balanced diet! They need carbon for energy and nitrogen to help build their bodies.

Some wastes are high in carbon. These include paper, sawdust, wood chips, straw, leaves, weeds, and other garden wastes.

Other wastes are high in nitrogen. These include food, grass clippings, and manure, vegetable peels, fruit peels, seeds, coffee grounds and filters, eggshells, nutshells, and other food scraps.

If you choose to add worms, do not smother them! They need air to survive.

Be sure your compost container has holes to allow air to get into the compost pile. If possible, stir or turn your compost pile every week or so to let in more air. The decomposition process requires fresh air. Additionally, if you add worms, they need air to survive. If the worms do not get enough air, many of them will die, and other microorganisms that do not need air will break down the waste in your compost pile. These organisms give off a nasty smell and are slow workers. You would definitely prefer worms to work your compost pile!

Do not let the compost pile dry out. The decomposition process requires water. Also, if you add worms to the pile, they need water to survive. Your compost pile should be about as moist as a sponge that has just been wrung out.

The compost pile should not get too hot or too cold. The decomposition process will generate some heat. However, if you add worms they like temperatures of about 90 to 140 degrees Fahrenheit or 32 to 60 degrees Celsius. If the temperature is too low in your compost pile, many of the worms will die, and other microorganisms that work more slowly will come into your pile.

The compost process works best if the waste is broken down into small sizes. The waste will decompose faster. Furthermore, it is harder for worms to eat large pieces of food than to eat small pieces of food. For example, if you throw a whole apple into your compost pile, only a few worms can eat it at a time. If you cut up your apple into small pieces, then several worms can eat at once.

If you supply all these things - food, air, and moisture in a good-sized pile – the organic or worm compost pile will decompose nicely. The process can take anywhere from six weeks to three years, depending on how you care for it.

Steps to Creating a Mini Compost Pile

1. Predict what will happen to various items going into the mini compost pile. Note the predictions of each student for comparison after the project is complete.
2. Cut the top off the plastic two-liter bottle where it begins to curve in.
3. Fill the bottom of the bottle with some soil.
4. Add layers of organic waste, kitchen waste, and non-biodegradable items. Place a layer of dirt between layers. Place items near the edge of the bottle so students can see what happens to different items in the mini compost pile.
5. Poke the side of the bottle with the scissors to create SMALL holes – not large enough for the contents of the mini compost pile to spill. It is important for the compost pile to receive air, so the compost pile should not be too dense. Carefully arrange the layers loosely so that air may circulate.
6. Moisten the mini compost pile by spraying it with water after filling the bottle and after adding each layer. Do not flood the pile, just moisten it.
7. Make sure to keep your mini compost pile in equilibrium. In order for it to work, you will need the right amount of carbon and nitrogen waste, moisture, air, healthy dirt, and worms (optional.) See the guide for suggestions on how to keep the equilibrium.
8. After creating the mini compost pile, cover the top of the bottle with aluminum foil or plastic wrap and secure the mini-compost pile by placing a rubber band around the bottle. Poke a few holes in the roof.
9. Some classes may want to add earthworms or special red wiggler worms to the mini compost pile to speed up the composting process. They will help to produce healthier compost at the end of the project. Students can add the worms at the beginning of the project or anytime during the project. If you elect to add worms to the mini compost pile, wrap a piece of construction paper around the bottle and tape it together to keep light out. The worms do not like much light while working!
10. Let Mother Nature do its business. Occasionally stir the mini compost piles by shaking the bottles a little bit in order to circulate air. The composting process will take between one and three months.
11. Students should check on their mini compost pile regularly – either once a week or every other week. Students should write their observations in a journal. Compare the process with the predictions the students made at the beginning of the project.